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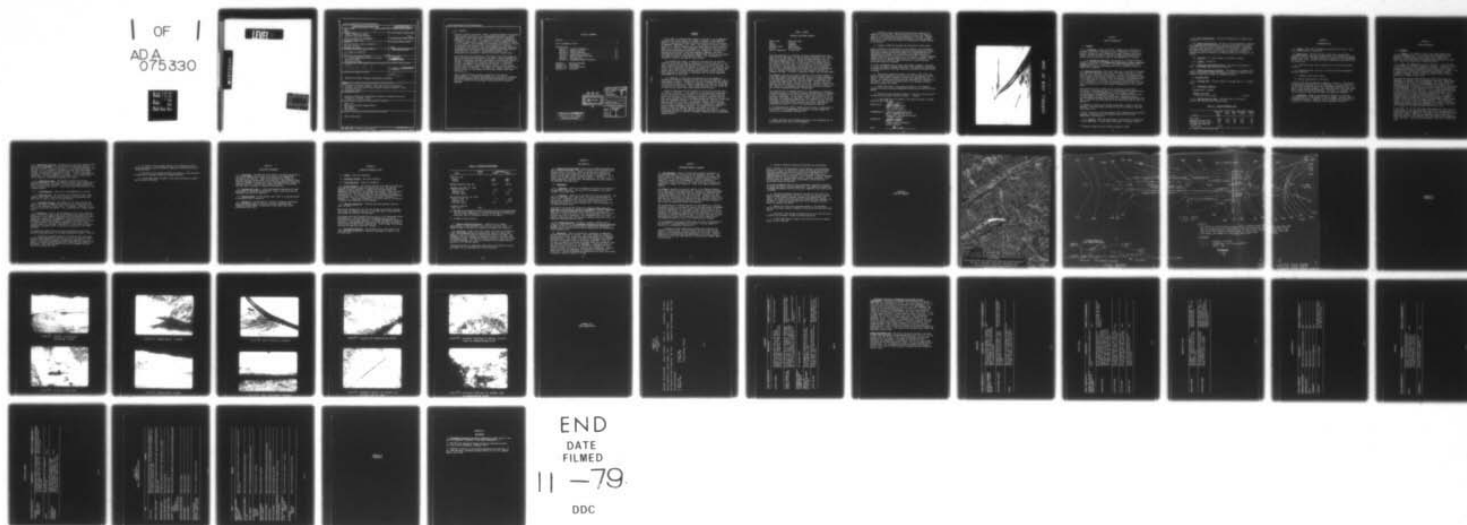
ARMY ENGINEERING DISTRICT NORFOLK VA  
NATIONAL DAM SAFETY PROGRAM. WHITE OAK CREEK DAM (ZARAHLEMLA) (O--ETC(U)  
AUG 79 J A WALSH

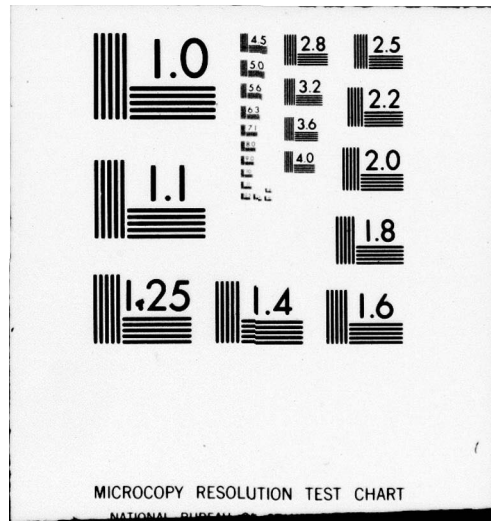
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SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

| REPORT DOCUMENTATION PAGE   |                       | READ INSTRUCTIONS<br>BEFORE COMPLETING FORM                         |
|---|-----------------------|---|
| 1. REPORT NUMBER<br>VA<br>05104   | 2. GOVT ACCESSION NO. | 3. RECIPIENT'S CATALOG NUMBER<br>Abstract                           |
| 4. TITLE (and Subtitle)<br>Phase I Inspection Report<br>National Dam Safety Program<br>WHITE OAK CREEK DAM (ZARAHMLA)<br>Dickenson County, VA   |                       | 5. TYPE OF REPORT & PERIOD COVERED<br>Final                         |
| 7. AUTHOR(s)<br>Norfolk District Corps of Engineers<br>803 Front Street<br>Norfolk, VA 23510  |                       | 6. PERFORMING ORG. REPORT NUMBER                                    |
| 9. PERFORMING ORGANIZATION NAME AND ADDRESS<br>(10) James A. Walsh  |                       | 8. CONTRACT OR GRANT NUMBER(s)<br>None                              |
| 11. CONTROLLING OFFICE NAME AND ADDRESS<br>U. S. Army Engineering District, Norfolk<br>803 Front Street<br>Norfolk, VA 23510  |                       | 10. PROGRAM ELEMENT, PROJECT, TASK<br>AREA & WORK UNIT NUMBERS<br>1 |
| 14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office)<br>(9) Final rept.  |                       | 12. REPORT DATE<br>August 1979                                      |
|   |                       | 13. NUMBER OF PAGES   |
|   |                       | 15. SECURITY CLASS. (of this report)<br>Unclassified                |
|   |                       | 15a. DECLASSIFICATION/DOWNGRADING<br>SCHEDULE                       |
| 16. DISTRIBUTION STATEMENT (of this Report)<br>(12) 43<br>Approved for public release; distribution unlimited.  |                       |   |
| 17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)<br>(9) National Dam Safety Program. White Oak Creek Dam (Zarahemla)<br>(05104), Big Sandy River Basin, Dickenson County, Virginia. Phase I<br>Inspection Report. |                       |   |
| 18. SUPPLEMENTARY NOTES<br><br>Copies are obtainable from National Technical Information Service,<br>Springfield, Virginia 22151  |                       |   |
| 19. KEY WORDS (Continue on reverse side if necessary and identify by block number)<br><br>Dams - VA<br>National Dam Safety Program Phase I<br>Dam Safety<br>Dam Inspection  |                       |   |
| 20. ABSTRACT (Continue on reverse side if necessary and identify by block number)<br><br>(See reverse side)   |                       |   |



## 20. Abstract

Pursuant to Public Law 92-367, Phase I Inspection Reports are prepared under guidance contained in the recommended guidelines for safety inspection of dams, published by the Office of Chief of Engineers, Washington, D. C. 20314. The purpose of a Phase I investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general conditions of the dam is based upon available data and visual inspections. Detailed investigation and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the investigation is intended to identify any need for such studies.

Based upon the field conditions at the time of the field inspection and all available engineering data, the Phase I report addresses the hydraulic, hydrologic, geologic, geotechnic, and structural aspects of the dam. The engineering techniques employed give a reasonably accurate assessment of the conditions of the dam. It should be realized that certain engineering aspects cannot be fully analyzed during a Phase I inspection. Assessment and remedial measures in the report include the requirements of additional indepth study when necessary.

Phase I reports include project information of the dam and appurtenances, all existing engineering data, operational procedures, hydraulic/hydrologic data of the watershed, dam stability, visual inspection report and an assessment including required remedial measures.

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## PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Investigations. Copies of these guidelines may be obtained from the Office of the Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation and analyses involving topographic mapping, subsurface investigations testing, and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through continued care and inspection can there be any chance that unsafe conditions be detected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established guidelines, the spillway design flood is based on the estimated "Probable Maximum Flood" for the region (flood discharges that may be expected from the most severe combination of critical meteorologic and hydrologic conditions that are reasonably possible), or fractions thereof. Because of the magnitude and rarity of such a storm event, a finding that a spillway will not pass the design flood should not be interpreted as necessarily posing a highly inadequate condition. The design flood provides a measure of relative spillway capacity and serves as an aid in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

## PHASE I REPORT

### NATIONAL DAM SAFETY PROGRAM

Name of Dam: White Oak Creek  
State: Virginia  
County: Dickenson  
USGS Quad Sheet: Jenkins East  
Stream: White Oak Creek  
Date of Inspection: 12 June 1979

White Oak Creek Dam is an earthfill structure approximately 640 feet long and 28.5\* feet high. The dam is owned and operated by Mr. Charles Baker of Clintwood, Virginia. The dam provides recreation for the surrounding campgrounds and is located in Dickenson County about 0.2 mile east of Wise County and 1.5 miles south of the Kentucky border. Two concentric vertical pipes (40 inch diameter and 64 inch diameter) are located 15 feet upstream of the dam and serve as the principal spillway that discharges downstream through a 30 inch corrugated metal pipe. An earthen side channel on the left abutment serves as the emergency spillway. The dam is classified as small size and high hazard.

The emergency spillway will pass 29 percent of the Probable Maximum Flood (PMF) without overtopping the dam. Based on criteria established by the Department of the Army, Office of the Chief of Engineers (OCE), the Spillway Design Flood (SDF) is  $\frac{1}{2}$  PMF to PMF. Based on the risk involved with this project, the SDF is the PMF. The water velocities combined with weak soils will cause erosion and potential failure of the dam. Therefore, the emergency spillway is rated seriously inadequate and the dam is assessed as unsafe, non-emergency.

The classification of "unsafe" applied to a dam because of a seriously inadequate spillway is not meant to connote the same degree of emergency as would be associated with an "unsafe" classification applied for a structural deficiency. It does mean, however, that based on an initial screening, and preliminary computations, there appears to be a serious deficiency in spillway capacity so that if a severe storm were to occur, overtopping and failure of the dam would take place, significantly increasing the hazard to loss of life downstream from the dam.

It is recommended that within 2 months from the date of notification to the Governor of the Commonwealth of Virginia, the owner engage the services of a professional consultant to:

\* Height determined from streambed elevation at the downstream toe to the elevation of the crest of the embankment.



a. Determine by more sophisticated methods and procedures the adequacy of the spillway. The study should include a more detailed study of the Spillway Design Flood appropriate to this dam. Remedial measures to be considered include modification to the dam, spillway, flood plain, and/or any other method of eliminating the danger imposed by the project.

b. Perform a stability analysis and evaluate the outlet works.

Within 6 months of the notification to the Governor, the professional consultant's report of appropriate remedial mitigating measures should have been completed and the owner should have an agreement with the Commonwealth of Virginia for a reasonable time frame in which all remedial measures will be complete. In the interim, a detailed emergency operation plan and warning system should be promptly developed. Also during periods of unusually heavy precipitation, around-the-clock surveillance should be provided.

It is also recommended that an annual maintenance program be initiated to detect and control problems encountered. The inspection revealed the following maintenance items that should be scheduled by the owner within 12 months:

a. The erosion along the shoreline, the gully at STA 11+80, the shallow sloughs between STA 15+10 and 17+10, and the footpath from STA 16+00 to 17+10 should be regraded, dressed with compacted fill and seeded. The annual borrow hole should be backfilled with compacted fill and seeded. The rutted and exposed areas in the emergency spillway should be regraded and seeded.

b. Remove the trees in the discharge channel of the emergency spillway to prevent potential damming by obstructing flow and collecting debris.

c. The crest of the dam and spillway functions as a road and should be paved with a minimum 6 inches of crushed gravel.

d. A staff gage should be added to the intake structure to extend above the top of the dam.

Original signed by:

Submitted by: JAMES A. WALSH  
JAMES A. WALSH, P. E.  
Chief, Design Branch

Original signed by:  
Recommended by: CARL S. ANDERSON, JR.  
CARL S. ANDERSON, JR., P. E.  
Acting Chief, Engineering Division

Original signed by:  
Approved by: Douglas L. Haller  
DOUGLAS L. HALLER  
Colonel, Corps of Engineers  
District Engineer

Date:

SEP 21 1979



# OVERALL VIEW OF DAM

12 JUNE 1979



## SECTION 1

### PROJECT INFORMATION

#### 1.1 General:

1.1.1 Authority: Public Law 92-367, 8 August 1972, authorized the Secretary of the Army, through the Corps of Engineers to initiate a national program of safety inspections of dams throughout the United States. The Norfolk District has been assigned the responsibility of supervising the inspection of dams in the Commonwealth of Virginia.

1.1.2 Purpose of Inspection: The purpose is to conduct a Phase I inspection according to the Recommended Guidelines for Safety Inspection of Dams (Appendix VI, Reference 1). The main responsibility is to expeditiously identify those dams which may be a potential hazard to human life or property.

1.2 Project Description: White Oak Creek Dam is an earthfill structure about 640 feet long and 25 feet high. The crest of the dam is 13 feet wide and is at elevation 1005 feet TBM\*. A gravel road traverses the entire length of the dam and through the crest of the emergency spillway to 32 cabins located upstream of the left abutment. The upstream slope is 2.5 horizontal to 1 vertical (2.5:1) and the downstream slope of (2.5:1) grading to (3.0:1) near the downstream toe of the dam. The dam has a toe drain with two 6-inch outlets discharging into the stilling basin.

The principal spillway is made up of 2 concentric pipes placed vertically in the reservoir about 15 feet upstream of the upstream face of the dam. A 40-inch-diameter steel pipe is located inside a 64-inch-diameter corrugated metal pipe. The elevations of the crests are approximately 997 and 996, respectively. These pipes feed a 30-inch-diameter corrugated metal pipe that discharges downstream of the dam. A plan view and cross section of the dam are provided in plate II, appendix I.

The emergency spillway is an earthen side channel located on the left abutment. The crest length is about 60 feet at an elevation 1000 with side slopes (2:1).

A valve, rising out of the water about 15 feet upstream of the principal spillway, is believed to be an emergency gate valve to provide dewatering of the reservoir.

1.2.2 Location: White Oak Creek Dam is located about 0.2 miles east of Wise County and 1.5 miles south of Kentucky, in Dickenson County.

\* Elevations taken from field notes furnished by owner.

1.2.3 Size Classification: The dam is classified as a "small" size structure.

1.2.4 Hazard Classification: The dam is located immediately upstream of a campground which has permanent residents during most of the year. Therefore, the dam is given a high hazard classification in accordance with guidelines contained in section 2.1.2 of reference 1, appendix IV. The hazard classification used to categorize dams is a function of location only and has nothing to do with its stability or probability of failure.

1.2.5 Ownership: Mr. Charles Baker of Clintwood, Virginia.

1.2.6 Purpose: Recreation.

1.2.7 Design and Construction History: The dam was constructed in 1967. The designer and contractor are unknown.

1.2.8 Normal Operational Procedures: The operation is automatic with normal flows passing through the principal spillway and excessive flows passing automatically through the emergency spillway.

1.3 Pertinent Data:

1.3.1 Drainage Area: The dam controls a drainage area of 1.01 square miles.

1.3.2 Discharge at Damsite:

Maximum Flood - unknown

Emergency Spillway

Pool level at top of dam

1912 cfs

1.3.3 Dam and reservoir Data: Pertinent data on the dam and reservoir are shown in the following table:

Table 1.1 DAM AND RESERVOIR DATA

| Item                                  | Elevation<br>feet<br>TBM | Area,<br>acres | Acre-<br>feet | Watershed,<br>inches | Length,<br>miles |
|---------------------------------------|--------------------------|----------------|---------------|----------------------|------------------|
| Top of dam                            | 1005                     | 21.5           | 240           | 4.46                 | .29              |
| Emergency Spillway Crest              | 1000                     | 20.0           | 180           | 3.34                 | .28              |
| Principal Spillway Crest 1/           | 996                      | 18.4           | 140           | 2.60                 | .28              |
| Streambed at downstream<br>toe of dam | 976.5                    | -              | -             | -                    | -                |

1/ Crest of 64-inch intake pipe.



SECTION 2  
ENGINEERING DATA

2.1 Design: There were no design data available for review. There are no known sources of design data.

2.2 Construction: The only available construction records were presented in a U.S. Department of Agriculture, Soil Conservation Service Engineer Field Book. The book essentially outlined the site topographic survey notes. Also, included were several incomplete construction notes as listed below:

- a. Intake and outlet invert elevations for the 30-inch principal spillway.
- b. Elevations across the crest of the dam including an emergency spillway elevation.
- c. Location of anti-seep collars.
- d. Details pertaining to a toe drain.

A sketch of the dam is presented in appendix I, plate II. The sketch is an approximate representation of the dam based on an interpretation of the available information and Corps of Engineers inspection notes. This sketch is not an exact document. The given elevations differ from those shown on USGS Jenkins East Quadrangle. Therefore, it is assumed that the construction field notes are based on a temporary benchmark.

2.3 Evaluation: Based on the available information, an adequate representation of the dam geometrics can be assumed. However, there is no design information. Therefore, there is insufficient information to evaluate the foundation condition and the embankment stability.

## SECTION 3

### VISUAL INSPECTION

#### 3.1 Findings:

3.1.1 General: The results of the 12 June 1979 inspection are recorded in appendix III. At the time of the inspection the pool elevation was approximately 995 feet TBM or about normal pool elevation. The outlet works were automatically releasing a very small flow. There are no known prior inspection reports.

3.1.2 Dam: The embankment is in fair condition. A plan view and cross section are provided in appendix I, plate II. An overall view of the dam is provided at the beginning of the report. Views of the upstream and downstream slopes are provided in appendix II, photos 1 and 4, respectively. There were no signs of surface cracks, unusual movement or seepage. However, there were several areas of erosion, depressions, sloughs, and wet spots.

Just above the upstream slope protection along the whole dam, the embankment has eroded. This area presently serves as a footpath which contributes to the erosion of the embankment. An animal burrow hole extending at least 3 feet into the embankment was located at the upstream waterline at about STA 14+10. The hole has caused some erosion of the embankment. A 75-foot-long slough was located on the upstream slope at about STA 13+35 to STA 14+10. It is a linear separation about 1.5 feet below the crest of the dam. It has sloughed about 1 foot in elevation and up to 2 feet horizontally upstream. At STA 11+80, a 2-foot-deep gully is located on the downstream slope. It appears it originally was a footpath that now serves as a gully for surface runoff. There are as many as 30 small surface sloughs located between stations 15+10 and 17+10 on the downstream slope. The sloughs are shallow, but surface runoff has caused erosion. There is a series of sewage lines passing through the embankment in this area. Also, there is a footpath up the slope from about STA 16+00 to 17+10.

At STA 14+00, 10, 15, 20, and 25 feet downstream of the toe, four 2.5 foot diameter, 6-inch deep depressions were found. The depressions are located on plate II, appendix I. The ones at 15 and 20 feet were filled with water. About 3 other similar depressions were located left of these, but were dry. One small wet spot was located on the downstream toe at STA 15+75. About 35 feet downstream of this area is another wet spot.



3.1.3 Appurtenant Structure: Observations of the intake structure were made from the embankment. It was not clear how water was passing through the intake during the inspection. It is assumed the gated valve was open, but it is possible the intake structure could have rusted through. The gated valve was heavily rusted. A view of the intake structure is provided in appendix III, photo 1. The stilling basin was unprotected. The basin appeared to be natural rock. A view of the outlet structure is provided in appendix III, photo 2.

3.1.4 Emergency Spillway: The approach channel was short and vegetated with grass. The crest served as a gravel road. Some areas of the crest were rutted and exposed. A view of the approach channel is shown in appendix III, photo 6. Trees blocked the lower portion of the discharge channel.

3.1.5 Instrumentation: There was no instrumentation on the dam.

3.1.6 Reservoir Area: The reservoir was surrounded by mild slopes vegetated with trees. There were 32 cabins in the surrounding area. There were no signs of erosion or slope failure.

3.1.7 Downstream Channel: The channel is tree lined, narrow, and about 4-feet deep. A campground with 20 plots is located within 100 yards of the embankment to the right of the channel. Families live at the sites during the warm months. Also, downstream is a sewage disposal lagoon.

3.2 Evaluation: Overall, the dam appeared to be in fair condition. However, the 75-foot-long slough on the upstream side coupled with the depressions in the immediate downstream area provide sufficient concern toward the integrity of the embankment. Further evaluation of the embankment is considered necessary. Included in this evaluation should be further study of the wet spots downstream of STA 15+75. Also, included should be a thorough investigation of the intake structure to determine if the gated valve is open and the condition of the intake structure.

The inspection revealed certain preventive maintenance items which should be scheduled as part of an annual maintenance program. These are:

a. The erosion along the shoreline, the gully at STA 11+80, the shallow sloughs between STA 15+10 and 17+10, and the footpath from STA 16+00 to 17+10 should be regraded, dressed with compacted fill, and seeded. The animal borrow hole should be backfilled with compacted fill and seeded. The rutted and exposed areas in the emergency spillway should be regraded and seeded.

b. The trees in the discharge channel of the emergency spillway should be removed to prevent potential damming by obstructing flow and collecting debris.

c. The crest of the dam and spillway functions as a road and should be paved with a minimum 6 inches of crushed-run gravel.

d. A staff gage should be added to the intake structure to extend above the top of the dam.



## SECTION 4

### OPERATIONS PROCEDURES

4.1 Procedures: The White Oak Creek Reservoir provides recreation in the form of swimming and fishing for visitors of the campgrounds surrounding the reservoir. Water flows automatically through the principal spillway during normal flow conditions. When excessive flows reach the emergency spillway crest water flows automatically through the emergency spillway. A gated valve located upstream of the principal spillway "may" be capable of dewatering the reservoir.

4.2 Maintenance of Dam: A routine maintenance program has not been established for the White Oak Creek Dam. Grass is cut often from the embankment and around the reservoir.

4.3 Warning System: At the present time, there is no warning system or evacuation plan in operation.

4.4 Evaluation: The dam does not require an elaborate operational and maintenance procedure. However, an annual maintenance and inspection program should be initiated to help detect and control problems that may occur.

## SECTION 5

### HYDRAULIC/HYDROLOGIC DATA

5.1 Design: None were available.

5.2 Hydrologic Records: None were available.

5.3 Flood Experience: Unable to determine.

5.4 Flood Potential: The Probable Maximum Flood (PMF) and  $\frac{1}{2}$  PMF were developed and routed through the reservoir by use of the HEC-1DB computer program (reference 2, appendix IV) and appropriate unit hydrograph, precipitation, and shortage-outflow data. Clark's TC and R coefficients for the local drainage area were estimated from basin characteristics. The rainfall applied to the developed unit hydrograph was obtained from a U.S. Weather Bureau publication (reference 3, appendix IV). Losses were estimated at an initial loss of 1.0 inch and a constant loss thereafter of .05 inch/hour.

5.5 Reservoir Regulation: Pertinent data and reservoir data are shown in Table 1.1.

Water flows automatically past the dam through the principal spillway and through the emergency spillway in the event water in the reservoir rises above the crests of the spillways.

The storage curve was developed with the use of a U.S. Geological Survey Quadrangle Map. Rating curves for the emergency spillway and the non-overflow section were developed. In routing hydrographs through the reservoir, it was assumed that the initial pool level was 1 foot below the principal spillway crest, elevation 995. Flow through the principal spillway was neglected during the routings.

5.6 Overtopping Potential: The probable rise of the reservoir and other pertinent information on reservoir performance is shown in the following table:



Table 5.1 RESERVOIR PERFORMANCE

| Item                                | Normal<br>flow | Hydrograph        |               |
|-------------------------------------|----------------|-------------------|---------------|
|                                     |                | $\frac{1}{2}$ PMF | PMF <u>1/</u> |
| Peak flow, cfs                      |                |                   |               |
| Inflow                              | 1              | 4974              | 9949          |
| Outflow                             | 1              | 4851              | 9805          |
| Maximum elevation feet, msl         |                | 1006.11           | 1007.12       |
| Emergency Spillway (el. 1000)       |                |                   |               |
| Depth of flow, ft.                  |                | 6.11              | 7.12          |
| Duration, hrs.                      |                | 12                | 13            |
| Velocity, fps <u>2/</u>             |                | 11.1              | 12.0          |
| Non-overflow section (el. 1005)     |                |                   |               |
| Depth of flow, ft.                  |                | 1.11              | 2.12          |
| Duration, hrs.                      |                | 1                 | 2.25          |
| Velocity, fps <u>2/</u>             |                | 4.8               | 6.7           |
| Tailwater elevation<br>feet, m.s.l. | 976.5          | -                 | -             |

1/ The PMF is an estimate of flood discharges that may be expected from the most severe combination of critical meteorologic and hydrologic conditions that are reasonably possible in the region.

2/ Average critical velocity.

**5.7 Reservoir Emptying Potential:** A gated valve is located approximately 15 feet upstream of the principal spillway intake. Not enough is known to evaluate its capability to dewater the reservoir.

**5.8 Evaluation:** Based on the size (small) and hazard classification (high) the recommended Spillway Design Flood (SDF) to  $\frac{1}{2}$  PMF to PMF. Because of the risk involved in this project the SDF is the PMF. The emergency spillway is capable of passing 29 percent of the PMF without overtopping the dam. The PMF will overtop the dam for less than 3 hours and reach a maximum of 2.1 feet over the dam with an average critical velocity of 6.7 feet per second.

Conclusions pertain to present-day conditions and the effect of future development on the hydrology has not been considered.

## SECTION 6

### DAM STABILITY

6.1 Foundation and Abutments: There is no information available on the foundation conditions. The dam is located in the ridge and valley geologic region of Virginia. Based on the available construction records and the visual inspection, the dam has a two foot-wide toe drain, and anti-seep collars as shown on plate II, appendix I. It is unknown how the dam is keyed into the foundation. As noted in the visual inspection, there are small depressions and wet spots located in the immediate downstream area.

#### 6.2 Embankment:

6.2.1 Materials: There is no information available on the nature of the embankment materials. The area soils are generally low plastic residual, silts, and clays.

6.2.2 Stability: There are no available stability calculations. The dam is 25 feet high and 13 feet wide. It has an upstream slope of 2.5H:1V and a downstream slope of 2.5H:1V grading into a 3H:1V slope. The dam has a freeboard of 5.5 feet and is not considered to be seriously subjected to a sudden drawdown due to its low freeboard and low capacity outlet works.

According to the guidelines presented in Design of Small Dams, U.S. Department of the Interior, Bureau of Reclamation for small homogeneous dams, with a stable foundation, not subjected to a drawdown, and composed of low plastic fines (CL,ML), the recommended slopes are 3H:1V upstream and 2.5H:1V downstream. The recommended width is 15 feet. Based on these guidelines the dam has an adequate downstream slope, but inadequate upstream slope and width.

6.2.3 Seismic Stability: The dam is located in Seismic Zone 2. Therefore, according to the Recommended Guidelines for Safety Inspection of Dams, the dam is considered to have no hazard from earthquakes provided static stability conditions are satisfactory and conventional safety margins exist.

6.3 Evaluation: There is insufficient information to adequately evaluate the stability of the dam. The visual inspection revealed an upstream slope failure coupled with small depressions in the immediate downstream area. Also, based on the Bureau of Reclamation guidelines the width and upstream slope of the dam are inadequate. Also, the spillway is incapable of passing the design flood and overtopping flows are considered detrimental to the embankment. Overtopping flows are shallow and only last 3 hours, but the velocity exceeds 6 fps, the effective eroding velocity for a vegetated earth embankment. Based on these conditions, the embankment is considered not sound and the services of a qualified geotechnical engineering firm should be retained to perform a stability check of the dam.



## SECTION 7

### ASSESSMENT/REMEDIAL MEASURES

7.1 Dam Assessment: There is insufficient available information to evaluate the foundation condition and the embankment stability. The visual inspection revealed a slough on the upstream side coupled with depressions in the downstream area which warrant sufficient concern toward the integrity of the embankment. There is insufficient information on the operations of the outlet structure to evaluate its capability to dewater the reservoir. There is no regular maintenance program.

The emergency spillway will pass 29 percent of the Probable Maximum Flood (PMF) without overtopping the dam. Based on criteria established by the Department of the Army, Office of the Chief of Engineers (OCE), the Spillway Design Flood (SDF) is  $\frac{1}{2}$  PMF to PMF. Based on the risk involved with this project, the SDF is the PMF. The water velocities combined with weak soils will cause erosion and potential failure of the dam. Therefore, the emergency spillway is rated seriously inadequate and the dam is assessed as unsafe, non-emergency.

The classification of "unsafe" applied to a dam because of a seriously inadequate spillway is not meant to connote the same degree of emergency as would be associated with an "unsafe" classification applied for a structural deficiency. It does mean, however, that based on an initial screening, and preliminary computations, there appears to be a serious deficiency in spillway capacity so that if a severe storm were to occur, overtopping and failure of the dam would take place, significantly increasing the hazard to loss of life downstream from the dam.

It is recommended that within 2 months from the date of notification to the Governor of the Commonwealth of Virginia, the owner engage the services of a professional consultant to:

a. Determine by more sophisticated methods and procedures the adequacy of the spillway. The study should include a more detailed study of the Spillway Design Flood appropriate to this dam. Remedial measures to be considered include modification to the dam, spillway, flood plain, and/or any other method of eliminating the danger imposed by the project.

- b. Perform a stability analysis and evaluate the outlet works.

Within 6 months of the notification to the Governor, the professional consultant's report of appropriate remedial mitigating measures should have been completed and the owner should have an agreement with the Commonwealth of Virginia for a reasonable time frame in which all remedial measures will be complete. In the interim, a detailed emergency operation plan and warning system should be promptly developed. Also during periods of unusually heavy precipitation, around-the-clock surveillance should be provided.

It is also recommended that an annual maintenance program be initiated to detect and control problems encountered. The inspection revealed the following maintenance items that should be scheduled by the owner within 12 months:

- a. The erosion along the shoreline, the gully at STA 11+80, the shallow sloughs between STA 15+10 and 17+10, and the footpath from STA 16+00 to 17+10 should be regraded, dressed with compacted fill and seeded. The annual borrow hole should be backfilled with compacted fill and seeded. The rutted and exposed areas in the emergency spillway should be regraded and seeded.

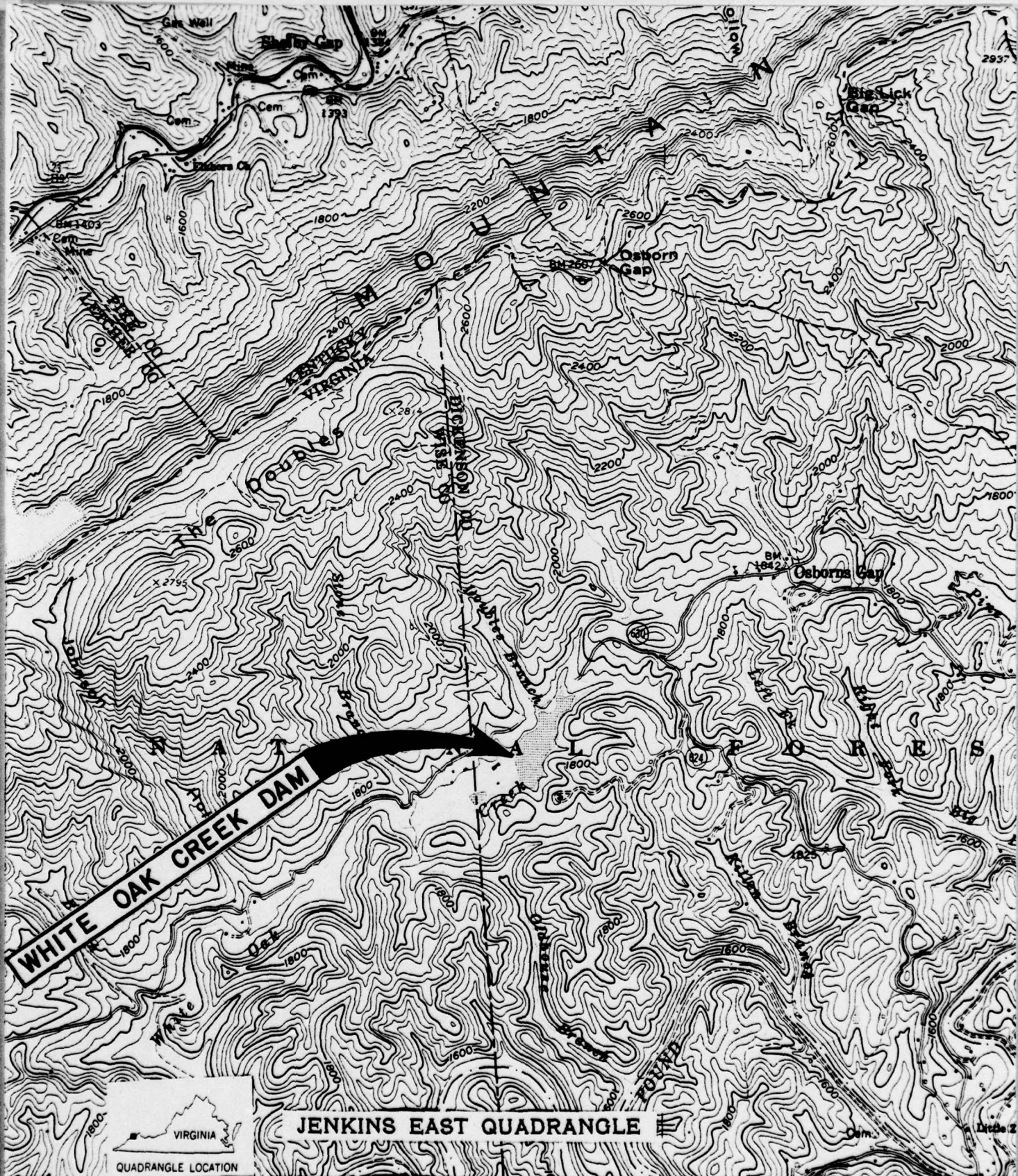
- b. Remove the trees in the discharge channel of the emergency spillway to prevent potential damming by obstructing flow and collecting debris.

- c. The crest of the dam and spillway functions as a road and should be paved with a minimum 6 inches of crushed-run gravel.

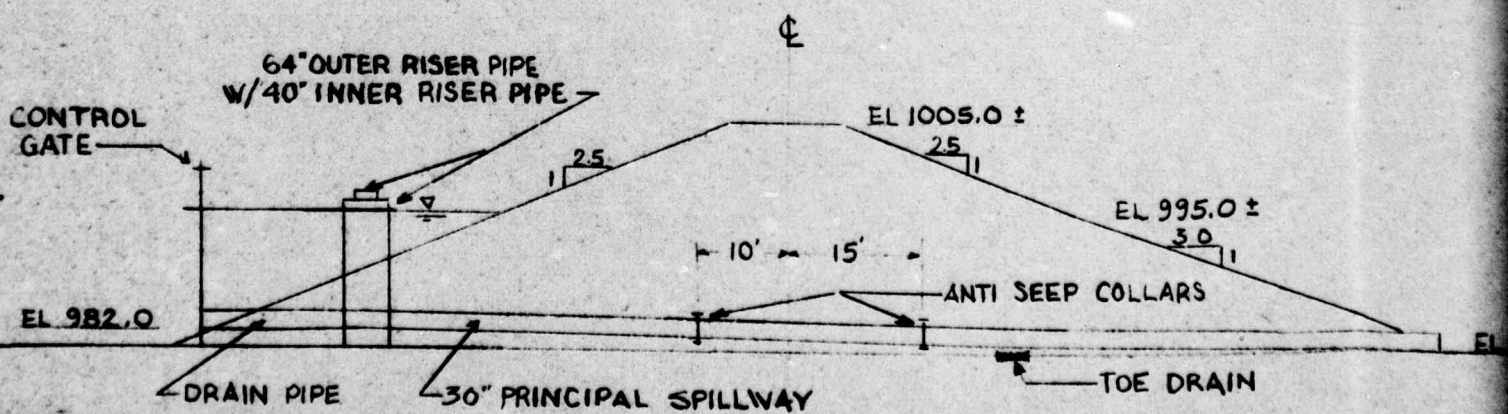
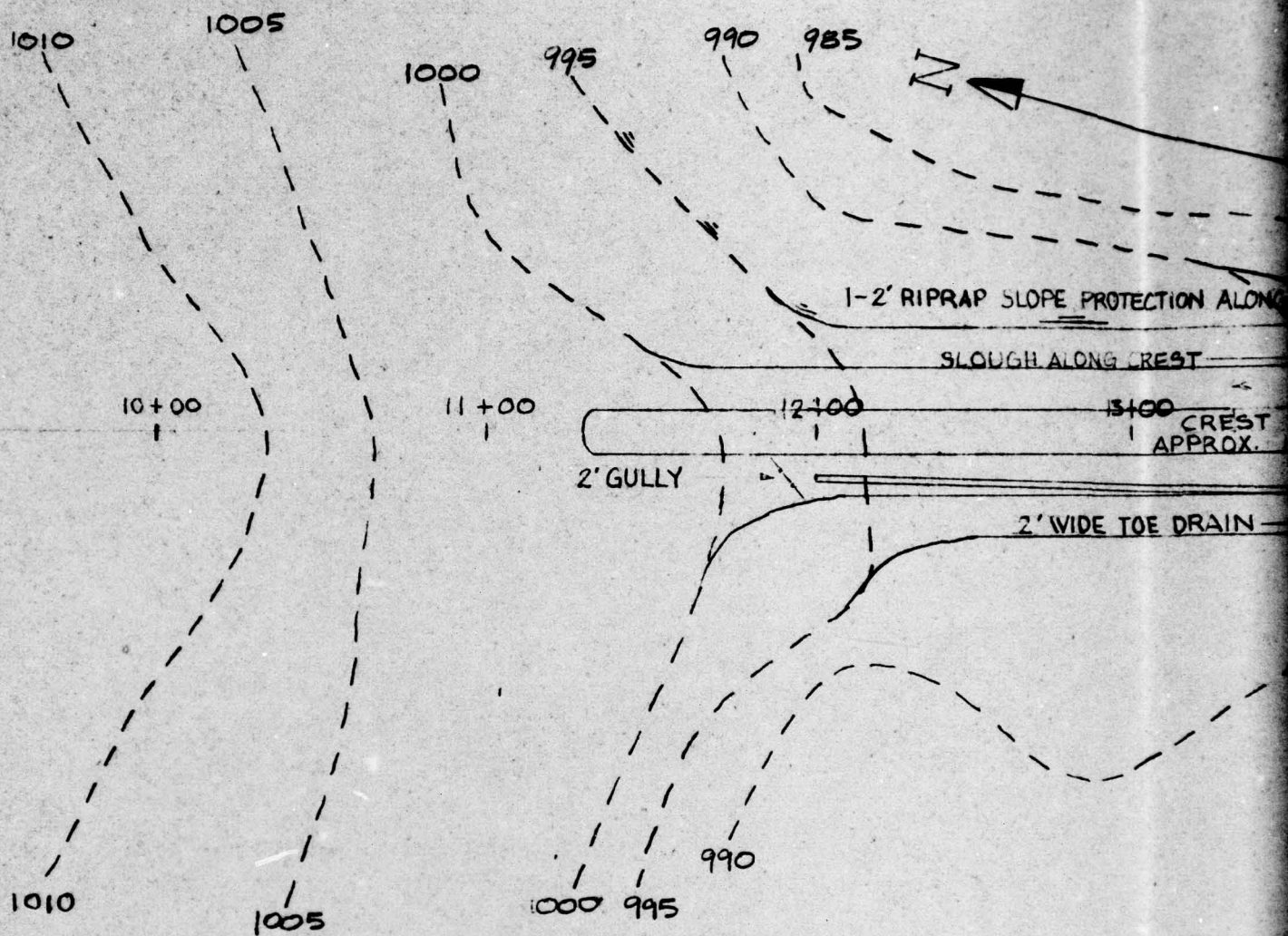
- d. A staff gage should be added to the intake structure to extend above the top of the dam.



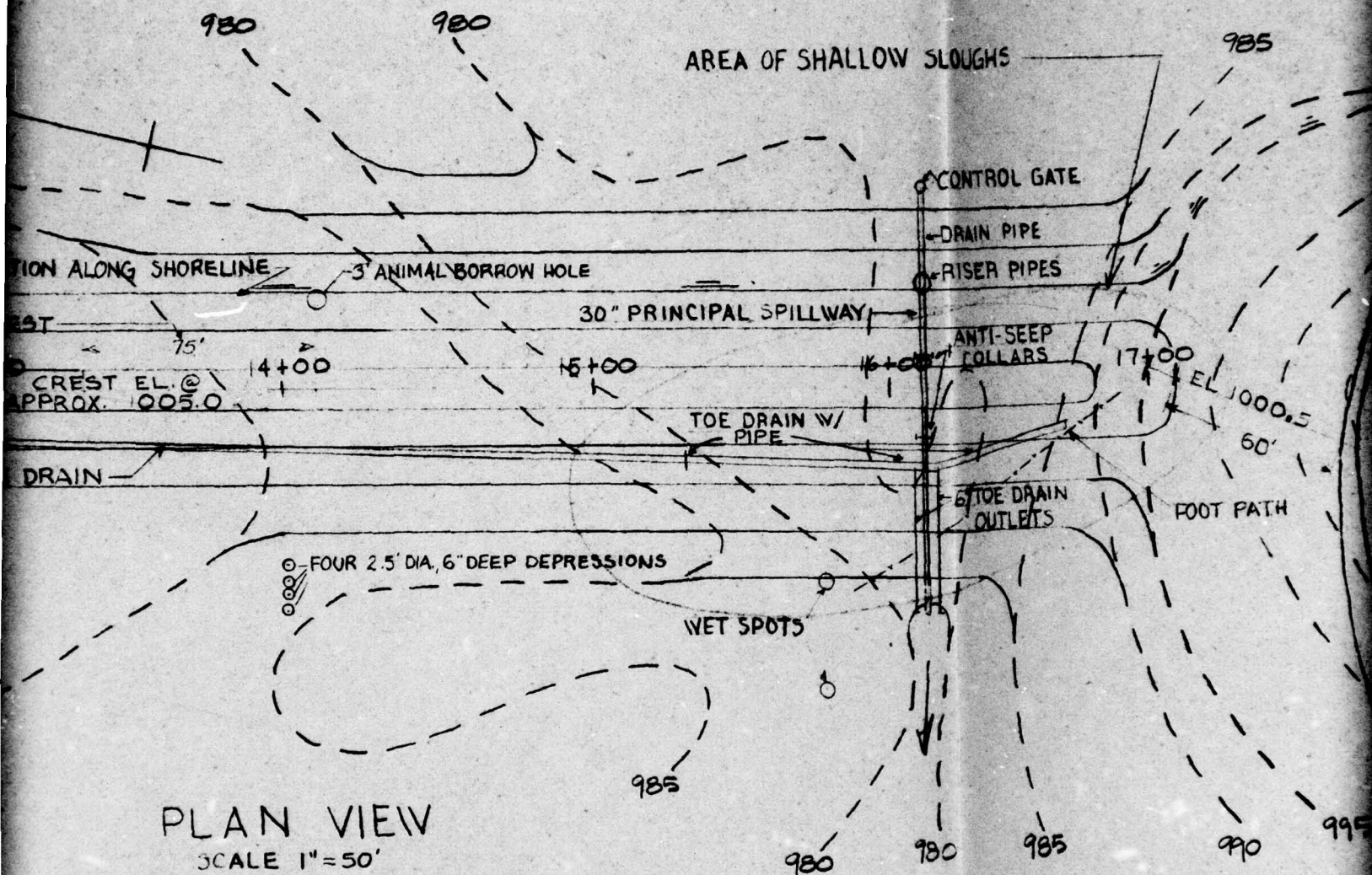
**APPENDIX I**  
**MAPS AND DRAWINGS**







CROSS SECTION

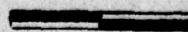


### NOTES

1. THIS SKETCH IS AN APPROXIMATE REPRESENTATION OF WHITE OAK DAM. THE VIEW AND CROSS SECTION WERE BASED ON THE AVAILABLE NOTES IN SCS ENGR. FIELD BOOK AND CORPS OF ENGRS. 12 JUNE 79 VISUAL INSPEC
2. ELEVATIONS ARE BASED ON A TEMPORARY BENCH MARK (TBM).

### LEGEND

- ORIGINAL CONTOURS
- EMBANKMENT AND SPILLWAY CONTOURS
- WATER LINE



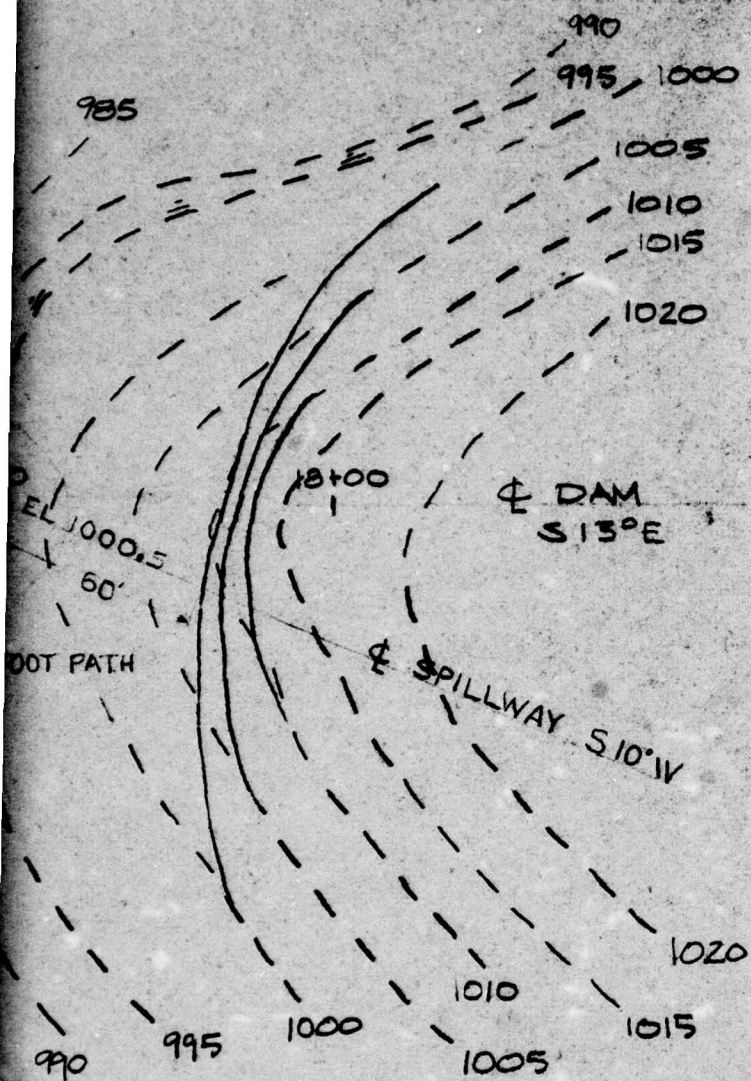
1" = 20'

1" = 50'

EL 980.0

2  
IVH





OAK DAM. THE PLAN  
 LE NOTES IN THE  
 VISUAL INSPECTION.  
 (TBM).

2  
 WHITE OAK DAM

3

APPENDIX II  
PHOTOGRAPHS





PHOTO #1 INTAKE STRUCTURE  
UPSTREAM SLOPE

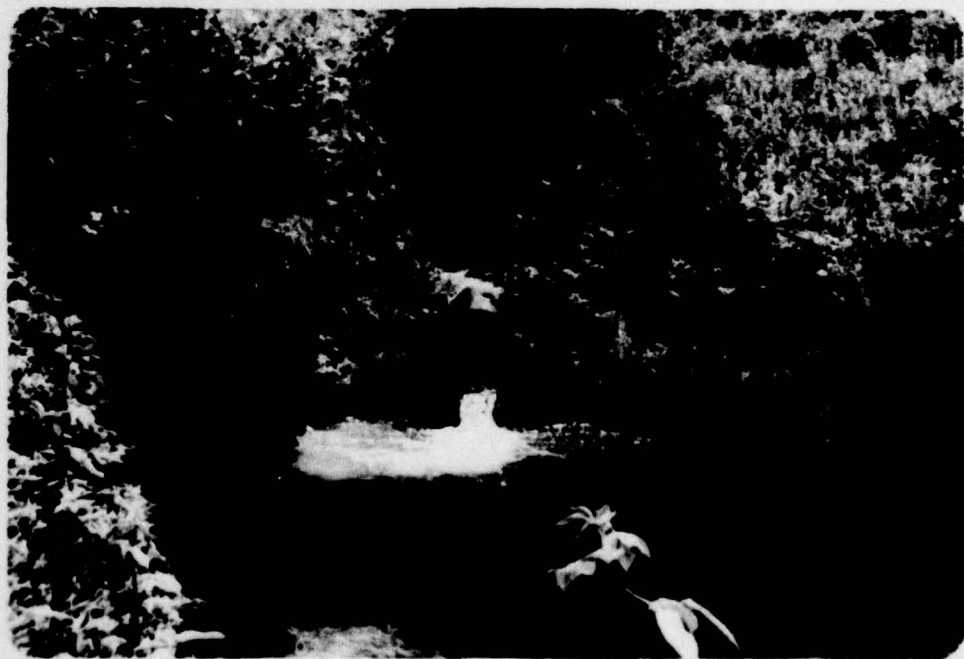


PHOTO #2 OUTLET STRUCTURE

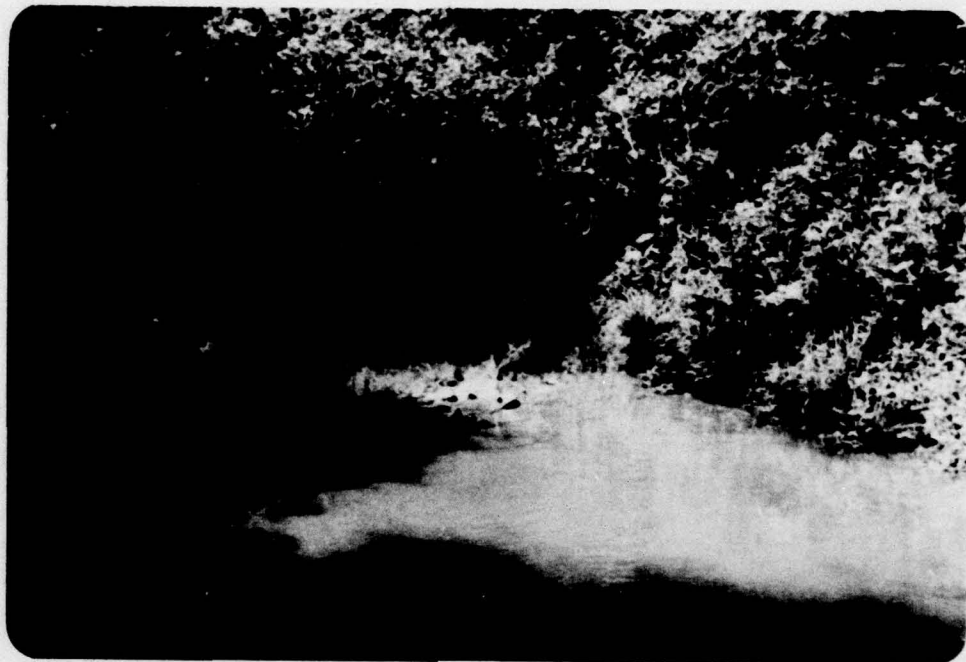


PHOTO #3 DOWNSTREAM CHANNEL



PHOTO #4 DOWNSTREAM SLOPE

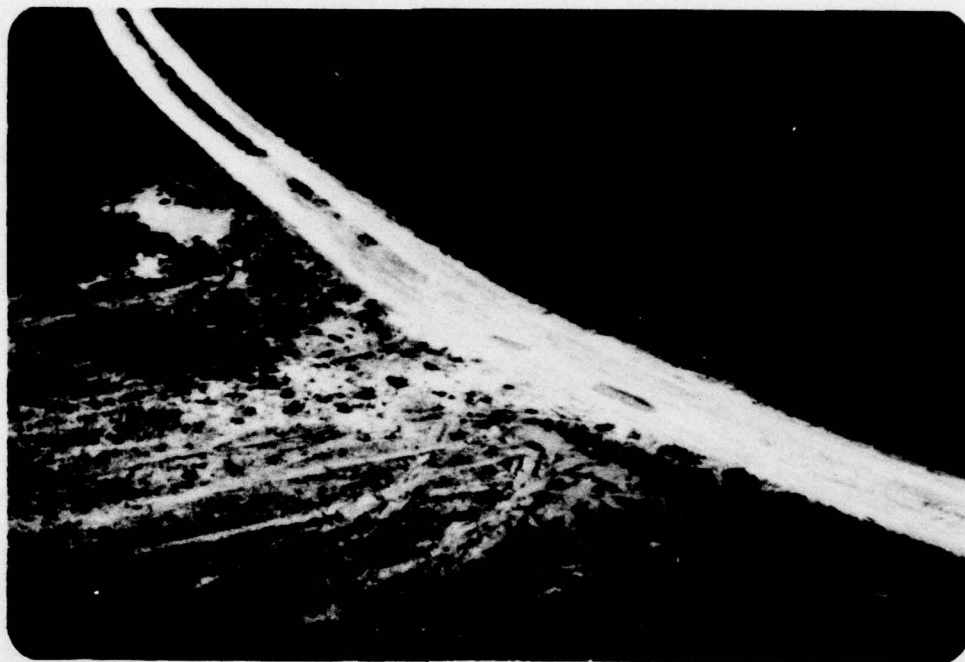


PHOTO # 5 EMS APPROACH CHANNEL



PHOTO # 6 EMS DISCHARGE CHANNEL





PHOTO # 7 SLOUGH ON DOWNSTREAM SLOPE

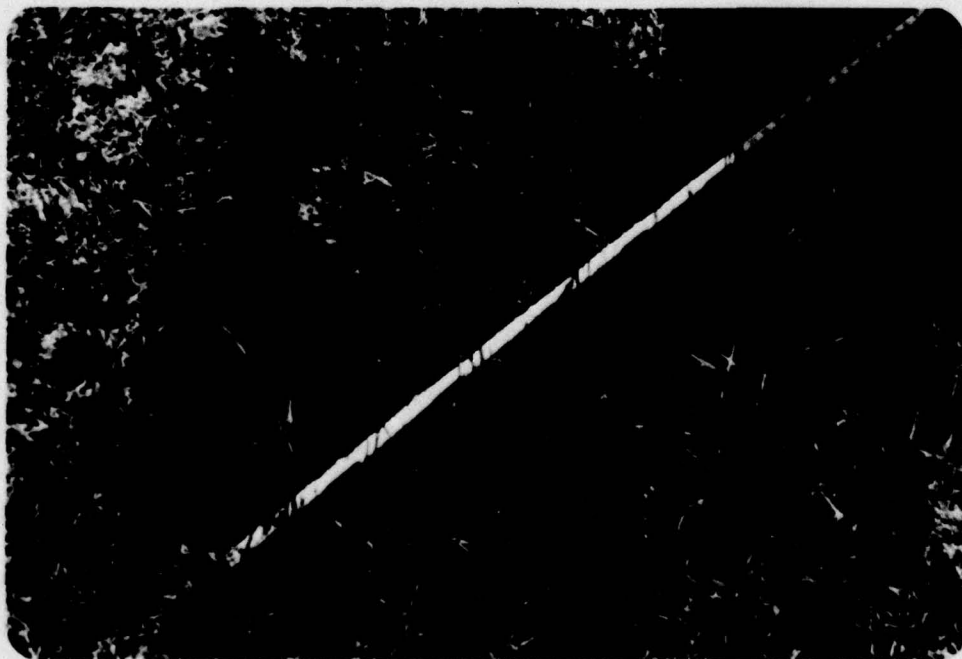


PHOTO # 8 STANDING WATER IN DEPRESSION  
BEYOND TOE OF DAM



PHOTO # 9 EXPOSED PORTION OF BURIED UTILITY  
LINES IN DOWNSTREAM SLOPE



PHOTO # 10 EXPOSED PORTION OF SEWER LINE  
IN DOWNSTREAM SLOPE



**APPENDIX III**  
**FIELD OBSERVATIONS**

APPENDIX III

Check List

Visual Inspection

Phase 1

Name Dam: White Oak Creek      County: Dickenson      State: VA      Coordinators: LAT 3710.9  
Date(s) Inspection: 12 June 79      Weather: Clear      Temperature: 65deg F      LONG 8233.0  
Pool Elevation at Time of Inspection: 995 T.B.M.      Tailwater at Time of Inspection: 976.5 T.B.M.

Inspection Personnel:

B. Taran, COE  
J. Robinson, COE

M. Dovel SWCB  
D. Pezza, COE

Pezza & Robinson, Recorder



# EMBANKMENT

| VISUAL EXAMINATION OF                                  | OBSERVATIONS   | REMARKS OR RECOMMENDATIONS   |
|--|--|--|
| SURFACE CHANGES  | No surface cracks were found. The dam is covered with grass up to 3 feet in height. However, the tall grass was sparse and did not hinder the visual inspection. The crest serves as a gravel road.  | The crest should be paved.   |
| UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND              | At Sta. 14+00 10, 15, 10, and 25 ft. downstream, of the toe, four 2.5 ft. diameter, 6 in. deep depressions were found. *About 3 other similar depressions were located left of these but were dry. There is no movement or cracking beyond the toe. The downstream area is kept cut. | Depressions should be monitored during periodic inspection.<br><br>*The depressions are located on Plate II. |
| SLOUGHING OR EROSION OF EMBANKMENT AND ABUTMENT SLOPES | See attached sheet   | See attached sheet   |
| VERTICAL AND HORIZONTAL ALIGNMENT OF THE CREST         | The alignment of the dam does not show any signs of movement. The top of the dam serves as a crushed gravel road.  | None   |
| RIPRAP FAILURES  | There is riprap along the waterline on the upstream slope. The riprap only protects about 1-2 feet of the slope.   | The riprap appears to be ineffective because of its limited range of protection                              |

1. Sloughing or Erosion of Embankment and Abutment Slopes:

OBSERVATIONS: Just above the upstream slope protection along the whole dam, the embankment has eroded. This area presently serves as a foot path which contributes to the erosion of the embankment. An animal burrow hole extending at least 3 ft. into the embankment was located at the upstream waterline at about STA 14+10. The hole has caused some erosion of the embankment. A 75 foot long slough was located on the upstream slope at about STA 13+35 to STA 14+10. It is a linear separation about 1.5 feet below the crest of the dam. It has sloughed about 1 foot in elevation and up to 2 feet horizontally upstream. At STA 11+80, a 2 foot deep gully is located on the downstream slope. It appears it originally was a foot path that now serves as a gully for surface runoff. There are as many as 30 small surface sloughs located between stations 15+10 and 17+10 on the downstream slope. The sloughs are shallow, but surface runoff has caused erosion. There is a series of sewage lines passing through the embankment in this area. Also, there is a foot path up the slope from about STA 16\_00 to 17+10.

REMARKS/RECOMMENDATIONS: The erosion along the shoreline, the gully at STA 11+80, the shallow sloughs between STA 15+10 and 17+10, and the footpath from STA 16+00 to 17+10 should be regraded, dressed with compacted fill, and seeded. The animal burrow hole should be backfilled with compacted fill and seeded. The 75 foot long slough inconjunction with the depressions noted in the above comment warrant further study. It is suspected the shallow sloughs found between Stations 15+10 and 17+10 were caused by leakage from the underground utility lines.



# EMBANKMENT

| VISUAL EXAMINATION OF                                       | OBSERVATIONS   | REMARKS OR RECOMMENDATIONS                                    |
|---|--|---|
| JUNCTION OF EMBANKMENT<br>AND ABUTMENT, SPILLWAY<br>AND DAM | There is no erosion, movement, cracking<br>or sloughing at the junctions. The right<br>upstream abutment is part of recreational<br>beach. A paved foot path follows along the<br>left downstream channel. | None  |
| ANY NOTICEABLE SEEPAGE                                      | One small wet spot was located on the<br>downstream toe about STA 15+75. About<br>35' downstream of toes area is another<br>wet spot.  | Wet spots should be monitored<br>during periodic inspections. |
| DRAINS  | There are two 6 inch discharge corrugated<br>metal outlets, one on each side of the<br>principal spillway. The left one was dry.<br>The right one was dripping clear water.                                | None  |



# OUTLET WORKS

| VISUAL EXAMINATION OF  | OBSERVATIONS  | REMARKS OR RECOMMENDATIONS   |
|--|---|--|
| CRACKING AND SPALLING OF<br>CONCRETE SURFACES IN<br>OUTLET CONDUIT | No cracking or spalling of concrete was<br>noted  | None   |
| INTAKE STRUCTURE   | The 64 inch CMP placed vertically acts<br>as the intake structure which is 15<br>feet from the shoreline of the upstream<br>embankment. A 40 inch rusted steel pipe<br>rests vertically in the center of the 64<br>inch pipe. The 64 inch pipe crest is 0.9<br>inch above water and the 40 inch crest is<br>1.7 inches above the water surface. | It is not clear how water is<br>passing through the intake<br>structure. |
| OUTLET STRUCTURE   | The outlet structure is a 30 inch wide<br>diameter CMP. Four inches of clear water<br>was flowing at the invert of the pipe.  | None   |
| STILLING BASIN   | The stilling basin (no riprap) is 40<br>feet wide and 40 feet long. The bottom<br>of the basin appears to be natural rock.  | None   |
| EMERGENCY GATE   | A rusty wheel extends above the water<br>surface, 10 feet upstream of the<br>intake structure.  | None   |

## EMERGENCY SPILLWAY

|                   |   |  |
|-------------------|---|--|
| APPROACH CHANNEL  | The channel is short and lightly vegetated. A graveled road traverses the channel. There are some bare areas and minor erosion.                   | The bare areas should be regraded and seeded. The road should be paved.  |
| DISCHARGE CHANNEL | Some wet and muddy areas are located in the discharge channel. The left slope has no vegetation on it. A thick growth of trees block the channel. | The bare areas should be regraded and seeded. The trees should be removed in the channel to prevent potential damming by obstructing flow and collecting debris. |



# INSTRUMENTATION

| VISUAL EXAMINATION    | OBSERVATIONS                              | REMARKS OR RECOMMENDATIONS   |
|-----------------------|---|--|
| MONUMENTATION/SURVEYS | There are no known monuments in the area. | None   |
| OBSERVATION WELLS     | There are no wells.                       | None   |
| WEIRS                 | There are no weirs                        | None   |
| PIEZOMETERS           | There are no piezometers.                 | None   |
| STAFFGAGES            | There are no staffgages.                  | A staff gage should be added to the intake structure to extend above the top of the dam. |



# RESERVOIR

| VISUAL EXAMINATION OF | OBSERVATIONS   | REMARKS OR RECOMMENDATIONS |
|-----------------------|--|----------------------------|
| SLOPES                | There are mild slopes surrounding the reservoir. Trees line the left side of the reservoir while the right side is clear and flat. There are 32 cabins in the surrounding area. There are no signs of erosion or slope failures. | None                       |
| SEDIMENTATION         | It is not possible to evaluate sedimentation during the inspection.  | None                       |

# DOWNSTREAM CHANNEL.

| VISUAL EXAMINATION OF                         | OBSERVATIONS  | REMARKS OR RECOMMENDATIONS  |
|---|---|---|
| CONDITION<br>(OBSTRUCTIONS,<br>DEBRIS, ETC.)  | The unobstructed channel is approximately 8 feet wide and 4 feet deep. Trees line the channel beginning at the end of the stilling basin.   | Remove tree growth from channel banks 100 feet downstream of the outlet pipe. |
| SLOPES  | The channel slopes are flat immediately below the dam.  | None  |
| APPROXIMATE NO.<br>OF HOMES AND<br>POPULATION | A camp ground with 20 plots is located within 100 yards of embankment to the right of the channel. Families live at the site during the warm months. Also the camp contains a sewage disposal lagoon. | None  |

CHECK LIST  
ENGINEERING DATA  
DESIGN, CONSTRUCTION, OPERATION

| ITEM  | REMARKS   |
|---|---|
| PLAN OF DAM   | There is no plan view of the dam. The only available information is a SCS field note book which includes the original survey topographic notes and incomplete construction notes. |
| REGIONAL VICINITY MAP   | There is no other regional vicinity map other than the USGS Jenkins East Quadrangle map.  |
| CONSTRUCTION HISTORY  | The dam was constructed in 1967. The contractor is unknown.   |
| TYPICAL SECTIONS OF DAM   | There are no sections.  |
| HYDROLOGIC/HYDRAULIC DATA   | There are no data.  |
| OUTLETS - PLANS<br>-DETAILS<br>-CONSTRAINTS<br>-DISCHARGE RATINGS             | There are no plans and details, or know constraints and discharge ratings.  |
| RAINFALL/RESERVOIR RECORDS  | There are no records.   |
| DESIGN REPORTS  | There are no reports.   |
| GEOLOGY REPORTS   | There are no reports.   |
| DESIGN COMPUTATIONS<br>HYDROLOGY & HYDRAULICS AM<br>STABILITY SEEPAGE STUDIES | There are no computations or studies.   |



| ITEM  | REMARKS  |
|---|--|
| MATERIALS INVESTIGATIONS<br>BORING RECORDS<br>LABORATORY<br>FIELD | There are no investigation and boring records, or laboratory and field.<br>test results. |
| COST CONSTRUCTION SURVEYS<br>OF DAM                               | There are no known post-construction surveys.  |
| BORROW SOURCES  | There is no information pertaining to borrow sources.                                    |
| SPILLWAY PLAN<br>SECTIONS<br>DETAILS                              | There are no sections or details.  |
| OPERATING EQUIPMENT<br>PLANS & DETAILS                            | There are no plans or details.   |
| MONITORING SYSTEMS  | There is no information pertaining to monitoring systems.                                |
| MODIFICATIONS   | There are no records pertaining to modifications.  |
| HIGH POOL RECORDS   | There are no high pool records.  |
| POST CONSTRUCTION ENGINEERING<br>STUDIES AND REPORTS              | There are no known studies or reports.   |
| PRIOR ACCIDENTS OR FAILURE<br>OF DAM DESCRIPTION<br>REPORTS       | There are no known past accidents or failures.   |
| MAINTENANCE<br>OPERATION<br>RECORDS                               | There are no maintenance-operation records.  |

**APPENDIX IV**  
**REFERENCES**



## APPENDIX VI

### REFERENCES

1. Recommended Guidelines for Safety Inspection of Dams, Office of the Chief of Engineers, Department of the Army, Washington, D.C.
2. HEC-1DB Flood Hydrograph Package (Hydrologic Engineering Center, U.S. Army Corps of Engineers, September 1978).
3. "Seasonal Variation of the Probable Maximum Precipitation East of the 105th Meridian", Hydrometeorological Report No. 33, (U.S. Weather Bureau, April 1956).